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# Economic analysis of date palm marketing in Jigawa state – Nigeria

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**Abstract**
*Jigawa state is characterised by predominance of date palm production and marketing. Thus, this study aimed to determine the economic analysis of date palm marketing in Jigawa State Nigeria. Data were collected through questionnaire distributed to 122 sampled date palm marketers for both wholesalers and retailers. Purposive and simple random sampling techniques were employed in the in selecting the sample size while simple frequencies, percentages, means, gross margin analysis and truncated regression model were employed for the study. Marketers were generally the ages of 21-50 years with majority married and were categorized into retailers and wholesalers. Respondents had one form of formal education or the other with source of supply from wholesalers. Cost of transportation (0.342) and taxes (88.82) reduce gross margin while years of formal education (0.0213), household size (0.0223) and quantity sold (40.8413) increase gross margin for retailers. However, cost of transportation (0.1252), cost of loading and offloading (3.26), cost of commission agents (0.0007) and cost of threading (0.1004) reduce gross margin while quantity sold (104.5665) increase gross margin for wholesalers. The model is well specified with Hat-square value 0.72 and 0.79 for retailers and wholesalers respectively and all the values in the models were well specified with the absence of inter-dependency among independent various ascertained by Wald chi-square of 634.74 and 759.38 respectively. In conclusion, marketeing of date palm is profitable and marketers were married males with one form of education or the other and only cost of transportation reduces profitability for both categories.*

**Keywords**: Marketing, Date palm, Truncated regression, Analysis and Jigawa State.

## 1. Introduction

Date palm is widely distributed species occurring in different geographic, soil and climate areas (El-Harami *et al*., 2011). Although date palm has been established in America particularly places like California, Arizona and Mexico, most of the trees are located in Middle East and North Africa (Dayang *et al*., 2014). Moreover, the crop requires high temperature and low relative humidity for optimal development of pollen and fruit setting and ripening respectively and it also requires large quantity of water drawn from deep soil through irrigation. In Nigeria date palm plantation started as long as the 17$^{th}$ century but the Nigerian date palm industry is characterized with lack of awareness of nutritional benefits of dates (Abul-Qadir *et al*., 2011).

The date fruits have high nutritive content and taste very sweet and the trees are the oldest cultivated tree fruits and the trees were mainly grown for their fruits (El Bana, 2018). Date palm require warm climates, water and high temperatures which is the practice for eight thousand years. Although date palm trees grow tall in watery areas but do not bear fruits with absence of high temperature (Karadeniz, 2023).

Moreover, all activities regarding date palm are restricted within production and sale.

Okolo *et al*. (2000) stated that date palm strives in the Northern parts of the country, especially in areas where the latitude is above 10° north of the equator. The date palm is essentially cultivated for its edible fruits with high nutrition, energy and a high value economic tree that produces 10-75kg of fruit per annum for a matured female which yields economic returns of about 200,000/ha/year (Ataga *et al*., 2012)

The date palm fruit and trunk of date palm is utilized in local industries, which supply packing materials for local marketing of fruits and vegetables as well as for many other uses. The tree and fruit by-products offer an extra income (Hassan *et al*., 2006). Various parts of date tree have been used for preparation of animal feed, construction materials, household goods, and paper (Anwar, 2006). The trunk of date tree is usually used to erect bucolic houses (roofs). Because it is a wood of poor quality from which no plates can be produced, it is often used for wood veneer or combustion. The leaves are important to the production of paper and cartons. The fruit captures seed and pulp. The seed (Endosperm) contains: 65% Hemilloze, 7% oil, 6% protein, enzyme Cytoze and Pulp. The Fruit is a fleshy, one seeded berry of a long, egg like, seldom round Shape (Al-Gboori and Krepl, 2010).

Dates are consumed as high energy food useful in cases of fatigue and is the main source of income in the irrigated deserts. The high sugar content, vitamins and minerals in date fruit makes it more useful to the younger generations, pregnant women and lactating mothers (Heiman, 1983; George *et al*., 2005).

Marketing assist in providing income for the local, state and national levels, it also aimed at providing support to producers and helps them increase in production by adopting new and improved technologies. Moreover, any development in the volume of trade characterized by enhanced marketing will generate for the government further support by providing basic amenities such as roads, infrastructures, and water storage facilities etc. which will finally improve the marketing efficiency (Olukosi *et al*., 2012). The allocation trade sector provides interference assistance between the upstream and downstream economic agents that is producers and consumers. Consequently, it effects the functioning of the market economy in totality and is particularly important to monetary policy because of its vital role in price formation. Ocampo (2020) mentioned that the inward-looking industrialization processes experienced in the post-war period was the protection of excessive domestic production that resulted to notable ineffectiveness and later led to situation of unable to restore powerful increase in international trade.

However, with the emerging of technological changes there is need to consider certain things for better future marketing as reinstated by World Economic Forum (2023) that there is need to deviate towards technologies for public good so that future technologies will be tilted towards addressing societal needs by putting into consideration the need of people that emphasized on relevance of agriculture, education and energy.

Over the years, marketing of agricultural produce in Nigeria particularly date palm has not been given the due attention that it requires. It is only recently that few studies like Omoti and Okolo (2000); Ata (2011); Mani (2014); Hamidu (2014) and Obadimu and Obadimu (2015) have been done on date palm. However, most of these studies have focused on production and were limited to a specific area of marketing. Systematic and adequate information on the process of market concentration and efficiency on date palm marketing is not well identified. Marketers of date palm in Jigawa state were constrained by reliable market information, lack of potential exchange partners, infrastructural facilities, institutional and instruments to manage

price and other risks which undermined their potentiality and growth.

Yet it is known that proper marketing systems provide incentives to farmers and traders to earn more. On the other hand, date palm concentration and efficiency are important factors to considering alternative market opportunities. The problem therefore identified on marketing at which traders use resources on these markets and how the various factors that explain efficiency, concentration, and marketing in these systems can be examined so as to improve date palm marketing in the state and the country in general.

The main problems of dates involve lack of improved varieties, bad farm management, inability to control and manage pest and diseases, proper harvesting, marketing and processing and low number of qualified staff involved in research and development. In order to solve these problems ecological groups are encouraging biological production which is ecologically pleasant approach and were discouraging conservative system. There is a lot of controversy concerning date palm producers who are engaged in converting conservative system to the modern organic system (Azadi *et al*., 2006). The broad objective of the study was to determine the economic analysis of date palm marketing in Jigawa State Nigeria while the specific objectives were to: describe the socio-economic characteristics of respondents in the area; and examine the influence of gross margin on some socio-economic variables of respondents in the area.

## 2. Literature Review

Naturally dates are pollinated by wind, however, they pollinated manually in modern commercial orchards and traditional oasis horticulture. We may observe natural pollination if the number of female and male plants but one male can pollinate about 100 females. However, growers concentrate in growing more females to obtain high yield because the serve as pollinators, thereby making producers invest in producing for female plants for more fruits. In some cases, many growers do not even maintain the male plants because the male pollen grains are sold in nearby local markets when there is need for pollinating the female plants (El Bana, 2018). Dates are exported to various countries at highly attractive prices especially the major varieties of date palm fruits which are distributed by marketers all over the world. In order meet the global demand large quantities of date palm fruits are exported domestically and internationally to raise income for individuals and countries (Jamshed and Ahmad, 2018).

In Nigeria, many varieties were imported into the country from nearby countries, these includes Tirgal and Deglet Noor imported from Algeria while a bigger and more expensive variety Dan Mali is imported from Mali. The country has indigenous varieties like the Palm 300 and Shuwarin all produced in Dutse Jigawa State (Isyaku *et al*., 2010).

Kotler (2003) define marketing as means of exchanging products, creating, and offering services between one another through social process by groups or individuals in obtaining there needs and wants. Benjamin and Emmanuel (2012) defined marketing as providing products to individuals or groups in proper place, time and form through a process of obtaining what they need or want. They added that in terms of agricultural produce, marketing begins immediately the farmer harvest his produce and it does not go directly to consumers but undergoes other processes like processing, transport and storage before it will be presented for sale.

El Bana (2018) examined a review on the cultivation, development and benefits of palm dates tree and concluded that the main source of income, basis of nutrition of the people in the area is cultivation of date palm and the yearly consumption of date fruits is up 50 kg. Karadeniz (2023) stated that in

terms of quality dates from Medina is the first while the second in quality is from Jerusalem and the third is from Tunisia, dates from Iran are of low quality and usually consumed by many during the month of Ramadan after undergoing stages of value addition. Jamshed and Ahmad (2018) pointed out that the date palm production is faced with the problem of health and economic potentials characterized by value addition and up-grading of quality affects the how income is generated and the level of profit in the industry. They added that Niche marketing will help in attracting buyers to the right products and explore utilization of full potentials in income generation. Lin and Liu (2018) mentioned that as a result of technology human labour may be replaced with robots in future so it is very imperative to differentiate between technological changes and improve in productivity. The policy efforts can focus on tackling the employment effects of new technologies through enhancing economic activities like care services and labour-intensive jobs to help in improving the quality of life.

The World Economic Forum (2023) indicated that government has the capabilities of act as "investors of first resort" and involve more involvement of the private sector in technologies and investment and select the best in order to create efficient markets in future. Example of this process could notice during pandemic, but it is essential to create ad hoc moves with more systematic approach and not to concentrate only on investment, crisis-driven and incentives to create new markets.

The study adopted the Structure-Conduct-Performance (SCP) paradigm which postulates that the interrelationship within the paradigm that the structure influences the conduct and the conduct influences the performance. This relationship indicated that chain may cause a reserves causation and the relationship could be unidirectional Ruttoh *et al*. (2018).

**Conceptual Framework of Relationship between Gross Margin and Socio-economic Characteristics**

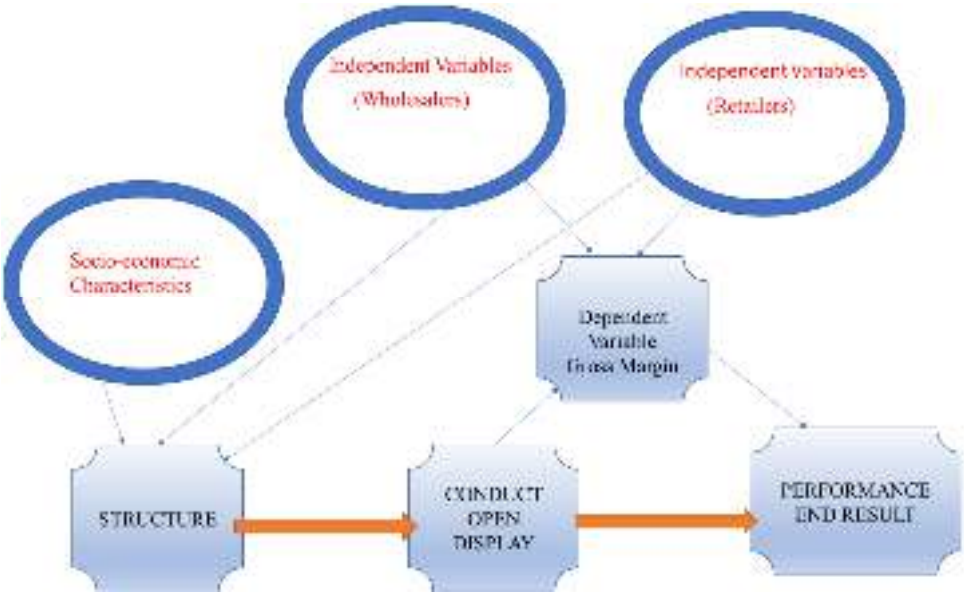


*Figure 1: Conceptual Framework of Relationship among Marketers*

## 3. Methodology

### Study Area

The study was conducted in Jigawa state, Nigeria which is located in the north-western part of Nigeria between longitudes 8°.00′E to 10°.15′E and latitudes 11°.00′N to 13°.00′N. The state has an estimated population of 5,828,200 people (Nigerian Population Commission NPC 2006). Majority (85%) of the population live in the rural area with about 90% involved in agriculture and animal husbandry (Sanusi *et al*., 2013). However, the people are engaged in both wet and dry season farming while the fertile soil is suitable for almost all tropical crops which enable the processing and marketing of agricultural produce around the state with weekly markets spread across all the local government areas in the state.

### Source of Data

Cross-sectional data was obtained through primary source with the aid of questionnaire distributed to sampled 122 date palm marketers in Jigawa state.

### Sampling Technique

The sampling techniques employed for the study were purposive and simple random sampling techniques. Eight markets namely Shuwarin, Babaldu, Gujungu, Maigatari, Gumel, Hadejia, Kazaure and Gwaram markets were purposively selected due to high number of date palm marketers in the area. However, marketers were divided into wholesalers and retailers. The total population for wholesalers was 44 out of which, 18 respondents were selected as sample and the total population for retailers was 261 out which a sample of 104 respondents were selected. The selection was based on a simple random selection of respondents using a sampling percentage 40% from each market, proportionate to the population in each market as shown in Table 1 below.

**Table 1: Sampling Technique of Date Palm Marketers in Jigawa State**

| Markets | Wholesalers | | Retailers | |
|---|---|---|---|---|
| | **Population** | **Sample** | **Population** | **Sample** |
| Shuwarin | 17 | 7 | 50 | 20 |
| Babaldu | 7 | 3 | 53 | 21 |
| Gujungu | - | - | 40 | 16 |
| Maigatari | 10 | 4 | 28 | 11 |
| Gumel | 5 | 2 | 30 | 12 |
| Hadejia | - | - | 30 | 12 |
| Kazaure | 5 | 2 | 20 | 8 |
| Gwaram | - | - | 10 | 4 |
| Total | 44 | 18 | 261 | 104 |

*Source: Author's Computation, 2023*

### Analytical Techniques

The analytical techniques employed for the study were simple frequency, percentages, means gross margin analysis and the truncated regression model.

### Gross Margin Analysis

Gross margin (GM) by definition is simply the difference between the total revenue (TR) and the total variable cost (TVC) (Olukosi and Erhabor, 2005) and is expressed as:

$$GM = TR - TVC \quad (1)$$

Where:

*GM*= Gross margin in naira of date palm per marketer per month

*TR*= Total revenue in naira/month

*TVC*= Total variable cost in naira/month

Here, the gross margin was used dependent variable which regressed against other independent variables both wholesalers and retailers.

**Truncated Regression Model**

The gross margin was used as a dependent variable used against various factors which affect gross margin as the independent variables. The gross margin (GM) was regressed on numerous factors affecting the level of profit using STATA software. Due to the presence of negative gross margin in the dependent variable in both retailers and wholesalers, it was necessary to run a truncated regression.

For retailers, the regression was conducted stepwise such that the highest insignificant variables which include threading cost, cost of empty bag and commission agents were removed respectively while cost of loading/offloading and cost of the product were respectively removed due the magnitude of signs of the variables.

The implicit form of the truncated regression for retailers can be specified as follows: -

$$GM^* = f(x_1 x_2 x_3 x_4 x_5)$$

(2)

Where:

$GM^*$ = Truncated dependent variable (Gross margin)

$X_1$= Years of formal education (Years),

$X_2$ = Household size (Number of people),

$X_3$ = Transportation cost (Naira),

$X_4$ = Quantity sold (Kg),

$X_5$= Taxes (Naira)

Therefore

$$Y_i^* = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \mu_i \quad (3)$$

Where:

$u_i$= Error term

$\beta_0$= Intercept

$\beta_1$ - $\beta_5$ = Parameters, and

$Y^* = Y$ If Y > 0

Where $Y^*$ = Truncated dependent variable.

For wholesalers the regression was conducted stepwise such that the highest insignificant variables which include cost of securing, taxes, years of formal education and household sizes were removed respectively while cost of empty bags and cost of the product were respectively removed due the magnitude of signs of the variables.

The implicit form of the regression for wholesalers can be specified as follows: -

$$GM^* = f(x_1 x_2 x_3 x_4 x_5)$$

(4)

Where:

$GM^*$ = Truncated dependent variable (Gross margin)

$X_1$= Cost of transportation (Naira),

$X_2$ = Quantity sold (kg),

$X_3$ = Cost of loading/offloading (Naira),

$X_4$ = Commission agents (Naira),

$X_5$= Cost of threading (Naira)

While

$$Y_i^* = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \mu_i \quad (5)$$

Where:

$u_i$= Error term

$\beta_0$= Intercept

$\beta_1$ - $\beta_5$ = Parameters, and

$Y^* = Y$ If Y > 0

Where $Y^*$ = Truncated dependent variable.

## 4. Results and Discussion

**Gender**

Gender distribution of respondents as presented in Table 2 below shows that 94.23% of the respondents were males while only 5.77% were females for retailers' category while all (100%) respondents were males in terms of wholesalers. This implies that men dominated date palm marketing in the area and this could be attributed to socio-cultural factors such as culture, tradition, and religion which affect women in the area. The dominance of date palm marketing by males in the study area is that in the study area women were expected to stay at home

and in the farm, while men struggle for survival through such businesses, and women in the area were expected to spend their time in the house taking care of children. However, women lack exposure to the businesses. This is because the business requires a lot of energy, which involves moving from one place to another for marketing. This agrees with Asogwa and Okwoche (2012) who studied marketing of agricultural produce among rural farm households in Benue State, Nigeria and found that 77% of the respondents involved in marketing were males.

The study is line with Okwo (2009) on economics of farm gate rice marketing which indicates that the high concentration of males in marketing activities could be attributed to high energy exertion required in different operations and most women are vulnerable to hard and tedious work and generally rice business is time and labour intensive thereby making it unattractive for women. However, women may be involved in businesses that are less tedious as ascertained by Osundo *et al*. (2014) indicated that marketing of vegetables in Abia State is dominated by women. Moreover, date palm fruit is usually marketer by males and could be attributed to socio- cultural attitudes of the people in the area.

**Age**

The mean age of the sampled retailers was 39.77 years with 35.58% in the age group of 31-40 years, 26.92% were in the age group of 41-50 years, while 23.08% were in the age group of 21-30 years, 11.54% in the age group of 51-60 years and 2.88% were in the age group of more than 60 years. The minimum age of sampled retailers was 21 years with a maximum of 65 years.

However, the mean age of sampled wholesalers was 45 years with a minimum of 26 years and a maximum of 72 years. The result revealed that 22.22% of sampled wholesalers were within the age range of 21-30 years, 31-40 years and 51-60 years respectively while 16.67% were in the age range of 41-50 years and greater than 60 years respectively. This reveals that most of the respondents were in the age group of 21-50 years for both wholesalers (61.11%) and retailers (89%) category and in their most active age, hence strong enough to participate in marketing activities. This agrees with Ata (2011) who revealed that date palm marketers belong to young and middle-aged group, while insignificant number of date palm marketers belongs to old age group. It is generally believed that with the increase in age, the individual becomes mentally mature and takes rational decisions and this can be one of the important factors affecting the marketing behaviour of respondents. The implication is that date palm marketing in the study area was patronized by young people who are strong enough to cope with the stress involved in the business and within age by which people are innovative and active in business. This is in conformity with Afolabi (2009) and Farayola *et al*. (2013) indicating that majority of the respondents belongs to the active segment of the population while the remaining belongs to the aged group.

**Marital Status**

The results in Table 2 below indicates that most (88.47%) of the sampled retailers were married while widow/widower and divorced/divorcee accounted for 2.88% and 0.96% respectively and single accounted for 7.69%. And for the sampled wholesalers, all (100%) the respondents were married. The result shows that, there are more married people in date palm marketing than those that are single, divorced and widow/widower. This may be as a result of more family responsibilities such as feeding, health care and education of the children while single producers face less responsibility. Furthermore, the predominance of married people in the business could be explained by the fact that large family size may provide a much

cheaper source of labour force. The is in consonance with Hamidu (2014) who studied the socio-economic characteristics and returns of date palm marketing in Gombe State, Nigeria which disclosed that 72.5% of sampled date palm marketers in the study were married.

Kabiru *et al*. (2016) conducted a study on the assessment of knowledge level of date palm in Dutse Local Government Area of Jigawa State, Nigeria also found about 99.1% of the respondents were married with the remaining 0.9% as widower. Another study which coincides with this study is a study conducted by Mubi *et al*. (2013) on marketing which also indicated that most (66%) the respondents were married with only about 27% single. This could be attributed to necessity in catering for the family responsibilities.

**Level of Education**

Level of education of respondents presented in the Table below which indicated that 42.31% of the sampled retailers had no formal education, 44.23% had primary education, while 12.50% had secondary education and 0.96% had tertiary education while 66.67% of sampled wholesalers had no formal education and 33.33% had primary education.

The study revealed that majority (57.69%) of the retailers had one form of formal education or the other, hence are expected to have the required knowledge and skills to enhance their marketing activities. However, majority (66.67%) of sampled wholesalers had no formal education which indicates that majority (57.69%) sampled retailers acquired one form formal education or the other more than the sampled wholesalers (33.33%). This agrees with the study of Hamidu (2014) which indicated that date palm marketers in Gombe had one form of formal education or the other. This is supported on the basis that education affects the way farm business is managed as well as overall production (Nkang *et al*., 2009).

Education is mostly associated with understanding the benefits associated with taking risk, and this can only be understood through education which makes risk to be undertaken by most educated people and serves as an essential tool in the adoption of new policies (Asogwa and Okwoche, 2012). The process of bringing about changes in human behaviour is education. In order to bring positive changes in an individual, education is the main relevant ingredient.

**Source of Supply**

The results in Table 2 below revealed that 59.62% of the retailers sourced their date palm from the wholesalers, 21.15% from rural assembly, 11.5% source their product from the farmer and only 6.73% from the buying agents. However, 11.11% of sampled wholesalers sourced their date palm from farmers and rural assembly respectively, while 22% sourced their date palm from buying agents and 55.56% sourced their date palm from other wholesalers. This is an indication of low productivity of date palm in the area despite the presence of date palm sub-section by the Federal Government under National Institute of Oil Palm Research (NIFOR).

However, this could be attributed to why date palms are imported in large quantity from neighbouring countries like Niger and Chad. Purchasing directly from the farmer will reduce marketing cost, hence will reduce exploitation by the middlemen. This was supported by the fact that commission middlemen enjoy the overall benefit in the entire marketing channel because the buyer pays another price known as commission apart from the actual purchase price which is commission for the selling agents (Olukosi *et al*., 2012).

This was further elaborated by Omoti and Okolo (2000) that Nigeria has two growing seasons in a year which has given the country more advantages to produce date palm in commercial quantity than other countries with only one growing season in

a year, yet the country is still constrained by producing at subsistence level thereby making production not matching with consumption mainly because most of the date palm consumed in the country is imported from neighbouring countries especially Niger, Chad and Sudan. The quantity of fresh produce produced and marketed is substandard and inconsistent, and the post-harvest wastage rates are high, thus creating problems for the marketing system. In theory, prices are important incentive in determining the supply of agricultural commodities in markets and producer rationality to raise the supply to market is mainly driven by the projected level of earnings. Conversely, low producer prices result to low market supply driven by prices offered in the destination markets (McCulloch and Ota, 2002).

**Table 2: Socio-economic Characteristics of Date Palm Marketers in Jigawa State**

| Gender | Retailer | | Wholesalers | |
|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentage |
| Male | 98 | 94.23 | 18 | 100 |
| Female | 6 | 5.77 | - | - |
| Total | 104 | 100 | 18 | 100 |
| Age (years) | | | | |
| 21-30 | 24 | 23.08 | 4 | 22.22 |
| 31-40 | 37 | 35.58 | 4 | 22.22 |
| 41-50 | 28 | 26.92 | 3 | 16.67 |
| 51-60 | 12 | 11.54 | 4 | 22.22 |
| >60 | 3 | 2.88 | 3 | 16.67 |
| Total | 104 | 100 | 18 | 100 |
| Mean | 39.77 | | 45 | |
| Minimum | 21 | | 21 | |
| Maximum | 65 | | 72 | |
| Marital Status | | | | |
| Married | 92 | 88.47 | 18 | 100 |
| Single | 8 | 7.69 | - | - |
| Widow/widower | 3 | 2.88 | - | - |
| Divorced/Divorcee | 1 | 0.96 | - | - |
| Total | 104 | 100 | 18 | 100 |
| Level of Education | | | | |
| No formal | 44 | 42.31 | 12 | 66.67 |
| Primary | 46 | 44.23 | 6 | 33.33 |
| Secondary | 13 | 12.50 | - | - |
| Tertiary | 1 | 0.96 | - | - |
| Total | 104 | 100 | 18 | 100 |
| Source of Supply | | | | |
| Farmer | 13 | 12.50 | 2 | 11.11 |
| Buying agent | 7 | 6.73 | 4 | 22.22 |
| Rural assembly | 22 | 21.15 | 2 | 11.11 |
| Wholesaler | 62 | 59.62 | 10 | 55.56 |
| Total | 104 | 100 | 18 | 100 |

*Source: Author's Computation, 2023*

**Truncated Regression Results of Retailers**

The regression analysis of retailers was obtained through stepwise analysis such that in the first step, cost of threading was removed because it the insignificant with the highest probability level (0.884) of the z statistics. In the second step cost of empty bag was removed with 0.737 probability level as the insignificant variable with highest probability and cost of securing was removed with 0.52 probability level in the third stage while cost of leather was removed with 0.439 probability level in the fourth step and cost of commission agents was removed in the fifth step with 0.382 probability level.

In the sixth step of the regression all the variables were significant at 0.05% probability level, but the magnitude of signs indicates a positive relationship between gross margin and cost of the product and between gross margin and cost of loading and offloading. The theoretical expectation is a negative relationship between gross margin and costs. Therefore, cost of loading and offloading was removed with 0.028 probability level in the sixth step and cost of the product cost was removed in the seventh step with 0.000 probability level. In the 8$^{th}$ step, all the variables in the model were significant with the correct magnitude of signs which had produced the desired result.

Also, the Variance Inflation Factor (VIF) was used to test for multicollinearity at ($p<0.05$) probability level. The VIF mean value of retailers was 1.58 which indicated that all the independent variables in the model are not collinear for retailers because the mean VIF value is less than 10. The insignificance of the hat-square value of retailers (0.72) indicated that the model is well specified which was tested at $p<0.05$ probability level. The Wald chi-square of 634.76 retailers and wholesalers measure the joint significance of the parameters and was found statistically significant ($p<0.05$) as indicated by its probability value, this implies that all the variables of the model are jointly, statistically and significantly affecting gross market margin as indicated in Table 3 below.

Based on the truncated regression of retailers, the results showed that there is positive and significant relationship between gross margin, years of formal education, household size and quantity sold while there is a negative and significant relationship between gross market margin, and cost of transportation and taxes as indicated by the z-statistics which was tested at 5% probability level. One-naira increase in the cost of transportation will reduce gross market margin by about ₦0.342/kg for retailers while one-naira increase in taxes will reduce gross margin by 88.82/kg. This is in line with Afolabi (2009) who found that all estimated coefficients were positive except the coefficient of transportation which denotes that increase in transportation cost will reduce profitability. The study is in line with Obadimu and Obadimu (2014) who found a negative relationship between cost of transportation and profit from date palm retail market. A one-year increase in years of formal education of retailers will increase gross margin by about ₦0.0213/kg. This indicates that the more educated a marketer more efficient he will be carrying out marketing decisions.

One-unit increase in household size of retailers will increase gross margin by about ₦0.0223/kg. The number of households could assist in marketing activities like bagging, threading and selling of date palm. One-unit increase in quantity sold of retailers will increase gross market margin by about ₦40.8413 which is in accordance with theoretical expectation because the quantity sold by marketer the more his sales and hence profitability. This agrees with the study conducted by Craig and Cris (2006) who posited that an increase in quantity of a commodity in marketing increases the income of a marketer.

**Table 3: Truncated Regression Analysis of Sampled Retailers**

| Variables | Coefficient | Standard error | z. statistics |
|---|---|---|---|
| $X_1$(Years of formal education) | 0.02122271 | 0.0089453 | 2.37* |
| $X_2$ (Household size) | 0.0223834 | 0.0048536 | 4.61* |
| $X_3$ (Cost of transport) | -0.0342319 | 0.0076288 | -4.49* |
| $X_4$ (Quantity sold) | 40.84127 | 3.635811 | 11.23* |
| $X_5$ (Taxes) | -88.81526 | 34.07523 | -2.61* |
| $C$ (Constant term) | -0.1233431 | 0.0798379 | -1.54 |
| VIF mean value 1.58 | | | |
| Hat-square value 0.72 | | | |
| Wald chi-square value 634.76* | | | |

*Source: Author's Computation, 2023*
* = Indicates significance at 0.05 probability level.

**Truncated Regression Analysis of Wholesalers**

The truncated regression of wholesalers was conducted stepwise whereby insignificant variables were removed sequentially based on insignificance of the variables and the magnitude of signs of the variables. In the 1st step cost of securing was removed because it the insignificant variable with the highest probability level (0.966) while the 2nd step lead to removal taxes of as insignificant variable with highest probability level of 0.891 and years of formal education was the 3rd variable removed with the 0.465 probability level. Household size was removed as the 4th variable because it is insignificant at 0.08 probability level while cost of leather was removed with probability level of 0.123. The 5th variable removed was cost of empty bag because of the positive sign of the coefficient of 0.00665 and cost of the product was also the 6th variable removed because of positive sign (0.30776) of the coefficient.

Also, the Variance Inflation Factor (VIF) was used to test for multicollinearity at ($p<0.05$) probability level. The VIF mean value of wholesalers was 6.27 which indicated that all the independent variables in the model are not collinear for wholesalers because the mean VIF value is less than 10. The insignificance of the hat-square value of wholesalers (0.79) indicated that the model is well specified which was tested at $p<0.05$ probability level based on the link test. The Wald Chi-square of 759.38 for wholesalers measure the joint significance of the parameters and was found statistically significant ($p<0.05$) as indicated by its probability value, this implies that all the variables of the model are jointly, statistically and significantly affecting gross market margin as indicated in the Table below.

Wholesalers indicated a positive and significant relationship between gross margin and quantity sold and a negative and significant relationship between gross margin and cost of transportation, cost of loading and offloading, commission agent and cost of threading as indicated by the z-statistics which was tested at 5% probability level. One-naira increase cost of transportation will reduce gross margin by about ₦0.1252/kg, one-naira increase in cost of loading and offloading will reduce gross margin by ₦297.4144 which is about ₦3.26/kg and one-naira increase in cost of commission agents will reduce gross margin by ₦0.0007/kg and one-naira increase in cost of threading will reduce gross margin by 0.1004. One-unit increase in quantity sold by wholesalers will increase gross margin by ₦104.5665/kg as shown in Table 4 below. This indicates that

quantity is highly related to gross margin more than all the variables captured by the model.

**Table 4: Truncated Regression Analysis of Sampled Wholesalers**

| Variables | Coefficient | Standard error | z. statistics |
|---|---|---|---|
| $X_1$(Cost of transportation) | -0.1252064 | 0.0256507 | -4.88* |
| $X_2$ (Quantity sold) | 104.5665 | 7.111966 | 14.70* |
| $X_3$ (Loading/offloading) | -297.4144 | 68.71922 | -4.33* |
| $X_4$ (Commission agents) | -0.0007554 | 0.0001262 | -5.99* |
| $X_5$ (Cost of threading) | -0.3521715 | 0.0086528 | -11.61* |
| $C$ (Constant term) | 0.3521715 | 0.1549686 | 2.27 |
| VIF mean value | 6.27 | | |
| Hat-square value | 0.79 | | |
| Wald chi-square value | 759.38* | | |

*Source: Author's Computation, 2023*
* = Indicates significance at 0.05 probability level.

## 5. Conclusion and Recommendations

In conclusion, marketing of date palm is dominated by males who were married and in their most active age, hence strong enough to participate in marketing. Both categories of marketers had one form of formal education or the other and had source their supply of date mainly from wholesalers. For retailers as years of experience, house size, quantity sold and cost of produce increase with increase in profit while increase in cost of transportation reduces profit. However, in the wholesalers' category, increase in years of household size, quantity sold, marketing cost and cost of the produce increases profit of date palm marketers while cost of transportation also reduces profit. It is also concluded that the model is well-specified with all independent variables not collinear to each other for both categories. Based on the result, the following recommendations were made

i) Cost of transportation reduces gross margin, hence profitability. Marketers are advised to make bulk purchase since purchasing in bulk will reduce their transportation cost.
ii) Marketers should also engage in date palm farming to ensure constant supply, since seedlings are available and affordable in (NIFOR) Dutse, Jigawa State.

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